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SCROPHULARIACEAE OF THE LOCAL FLORA. I

By Francis W. Pennell

In commencing the systematic study of a family of plants for North America there is logic in studying first those species which occur in the eastern seaboard of the United States. These were the plants first known in detail, if not necessarily those earliest discovered, on this continent. From Massachusetts to Carolina we are on classic ground, and here the plant-life has been worked over so many times, and each species so often collected, that we may now speak with certainty of nearly all specific identities.

The present study is concerned with but a portion of this territory, the counties included within the local flora range, of the Torrey Botanical Club and of the Philadelphia Botanical Club. These combined include all of Connecticut; New York southeast of Columbia, Greene and Delaware counties inclusive; all of New Jersey; Pennsylvania southeast of Pike, Wayne, Lackawanna, Luzerne, Schuylkill, Lebanon, Dauphin and Lancaster counties inclusive; Newcastle county, Delaware; and Cecil county, Maryland. This area is in main part represented in the Torrey Club collection at the New York Botanical Garden, and the portion within approximately fifty miles of Philadelphia in the remarkably full and valuable collection of the Philadelphia Club at the Academy of Natural Sciences in that city. To both collections I have had free access, and the records below include data from these, the herbaria of Columbia University, the Brooklyn Botanic Garden, the University of Pennsylvania and several other institutions. To the curators of all I am appreciative.

Nearly all the species native or naturalized within the area

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of this study I have myself collected and of each made descriptions of fresh corollas, and noted other features to be gained only in the field. The importance of such work in taxonomic study needs emphasis.

In the present revision keys are given to the genera and species. These are detailed for points of definite contrast. These keys apply only to the species of our flora, and the warning must be made that the generic and tribal contrasts *may* be of little or no assistance beyond this territory. But just such keys as these are of most value to the local worker, and moreover it is by combining such analyses from various regions that we may hope ultimately to build more thorough family keys. An inductive process!

For each genus the type-species is stated. For each native species information of its type is stated, quoted from the original describer. This includes the statement of the particular specimen from which the first description was made and of the place of its collection. The later history of each name is traced. Extra-limital synonyms, even if the names have been current here, are not included except by brief mention. But all names ever proposed based upon plants occurring native in this area are supposed to be included.

With respect to distribution I should like to undertake a study for which the data at hand in our herbaria is not yet sufficient. Moreover my own observations have not as yet been sufficiently prolonged over this area. The counties best represented in herbaria are those of Connecticut; New York, from the Highlands southeastward, including all Long Island; New Jersey, with considerable gaps to the northwest; Pennsylvania southeast of the Blue Ridge; and northern Delaware. Northwest of the Highlands and of the Blue Ridge botanical collections have been few and scattered, the regions best known being the Pocono Plateau of Pennsylvania, and sections of Ulster, Greene and Delaware counties, New York.

Dr. Witmer Stone, in his Plants of southern New Jersey, has traced with a master-hand the distribution of vegetation for the Coastal Plain portion of that state. That regions of as sharp

delimitation occur northward and westward, through the land of hills, of parallel mountain-areas with intervening trough-like valleys, of red soil derived from Triassic rock or of black soil from Ordovician limestone, of various soils derived from the ridges of shale, gneiss and sandstone, appears self-evident. In the northern portion of our territory glaciers, building lake and gravel habitats, have left us a new series of environmental conditions. Mr. Taylor's suggestive Flora does not attempt the detailed analysis of distribution which is demanded. I believe that the careful working-out of the ranges of the species of a few well-selected families of plants will give the knowledge we need for the dividing into phytogeographic areas of this varied inland—knowledge which will be nearly as definite as if multiplied by such a wealth of data as is presented by Dr. Stone. The problem is fascinating and it is with reluctance that I realize that the Scrophulariaceae have not yet been observed over a sufficient area or with sufficient thoroughness to warrant basing upon this study any contribution toward such a survey.

Our present study then attempts but these three goals: to present keys contrasting the genera and species of Scrophulariaceae in our flora, to make certain the nomenclature, and to give preliminary observations of distribution.

A. Corolla with the posterior lobes external in the bud. (Antirrhinoideae.)

B. Filaments five. Stigma capitate. Capsule septicidal. Sepals five, distinct.

C. Corolla rotate, slightly zygomorphic, its lobes much longer than the tube. Filaments all with fertile anthers. Leaves alternate. — I. VERBASCEAE.

1. *Verbascum.*

CC. Corolla tubular-campanulate, zygomorphic, its lobes shorter than the tube. Posterior filament without anther, the others didynamous. Leaves opposite. — II. CHELONEAE.

Corolla white, lavender or pink, pubescent or puberulent within, its anterior lobes projecting. Sterile filament slender, filiform, white.

Corolla membranous, white or lavender, puberulent or somewhat pubescent within over base of anterior lobes. Sterile fila-

ment as long as the others, pubescent on its posterior face. Anther-sacs distinct, glabrous or barbate with short hairs. Sepals lanceolate to ovate, acute to acuminate. Seeds wingless. Inflorescence compound, a raceme of cymosely branching lax flower-clusters. Stem-leaves clasping. 2. *Penstemon.*

Corolla semi-fleshy, white or rose, densely pubescent within over base of anterior lobes. Sterile filament much shorter than others, glabrous. Anther-sacs becoming confluent, densely lanose. Sepals ovate-orbicular, rounded. Seeds winged. Inflorescence simple, a spike-like raceme of single flowers on short several-bracted pedicels. Stem-leaves narrowed at base, short-petioled. 3. *Chelone.*

Corolla red-brown, glabrous within, its antero-lateral lobes vertically projecting, the anterior lobe deflexed. Sterile filament shorter than wide, two-lobed, yellow or red-brown. Inflorescence compound. 4. *Scrophularia.*

BB. Filaments four or two, the posterior one being lost.

C. Acaulescent. Corolla rotate, slightly zygomorphic, white or lavender-tinged. Capsule two-celled at base, septicidal. Stigma capitate. Small herb, spreading by stolons. III. Limoselleae. 5. *Limosella.*

CC. Caulescent, with leaves mainly cauline. Corolla zygomorphic, the lobes shorter than the tube. Capsule two-celled throughout. Inflorescence simply racemose.

D. Leaves opposite. Corolla without a spur. Stigma of two usually plate-like lobes. Capsule septicidal, or somewhat loculicidal by a simple split down median line of carpel. IV. Gratioleae.

Corolla yellow or white, with throat four-angled, its orifice open; pubescent within at base of posterior lobes. Postero-lateral stamens perfect, antero-lateral reduced to sterile filaments or wanting. Several bractlets at base of the five distinct sepals. Capsule septicidal, or tardily slightly loculicidal. 6. *Gratiola.*

Corolla yellow or lavender-blue, with throat somewhat flattened into a horizontal plane, channeled beneath and arched

posteriorly; pubescent within at base of anterior lobes. No bractlets below calyx.

Perfect stamens four, with slender straight filaments. Corolla 15–30 mm. long, its orifice nearly closed by the raised anterior lip; the posterior lobes rounded and nearly equaling anterior. Style without tubercle-like base. Capsule loculicidal, tardily somewhat septicidal. Sepals united over one-half length. 7. *Mimulus.*

Perfect stamens two; the antero-lateral filaments fused with corolla ridges, from near apex of which abruptly upcurving. Corolla lavender, 2–10 mm. long, its orifice open; the posterior lobes acute and shorter than the anterior, or else wanting. Style with white persistent tubercle-like base. Capsule septicidal, the thin plate-like septum persisting.

Corolla 6–10 mm. long, with two posterior lobes developed. Postero-lateral stamens perfect, antero-lateral filaments without anthers. Sepals five, united at base. Plants erect or ascending, with leaves 1–3 cm. long. 8. *Ilysanthes.*

Corolla 2 mm. long, with two posterior lobes lost. Postero-lateral stamens lost, antero-lateral filaments with anthers. Sepals four (the posterior lost), united nearly four fifths their length. Plant repent, with leaves .3–.5 cm. long. 9. *Hemianthus.*

DD. Leaves alternate. Corolla with a spur at the base of the anterior petal. Stigma capitate. Capsule loculicidal, the septum with adjacent capsule-wall persisting, the remaining wall splitting irregularly. V. ANTIRRHINEAE.
10. *Linaria.*

AA. Corolla with the anterior lobes external in the bud. (Rhinanthoideae.)

B. Stamens two, the postero-laterals present, the antero-laterals completely lost. Antero-lateral lobes of corolla external in bud. Not parasitic. Sepals four, the posterior lost. Posterior lobes of corolla completely fused. VI. DIGITALEAE.

Leaves whorled. Corolla white, its lobes shorter than the tube. Capsule acute, longer than broad, not flattened. Plant 10–20 dm. tall. 11. *Veronicastrum.*

Leaves opposite or alternate. Corolla blue, its lobes longer than the tube. Capsule acute to deeply notched, broader than long, flattened. Plants lower. 12. *Veronica.*

BB. Stamens four, didynamous, the antero-laterals usually slightly the longer. Parasitic on roots of other plants.

C. Sepals five, alike, more or less united. Corolla-lobes all somewhat distinct, the posterior spreading or broadly arched; anterior lobe external in bud. Stigma elongated. Capsule loculicidal, splitting through septum. VII. BUCHNEREAE.

Corolla yellow or pink, campanulate, with inflated throat and open orifice. Stamens all perfect, the anthers two-celled, lanose. Two stigmatic lines down each side of style-apex. Filaments and style nearly as long as the tube of the corolla. Capsule exserted from the calyx-tube.

Corolla yellow. Capsule acute to acuminate. Leaves lanceolate to ovate, entire to bipinnatifid, petioled. Stem stout, over 4 dm. tall. Perennials or annuals. 13. *Aureolaria.*

Corolla pink, with red spots within on anterior side. Capsule rounded, with a mucro. Leaves filiform to lanceolate, entire or auriculate-lobed at base, sessile. Stem slender, usually lower. Annuals.

Stem ascending-scabrellous to glabrous. Leaves linear to filiform, entire. Pedicels over 1 mm. long. Calyx-lobes linear to subulate, slightly longer to usually much shorter than the tube. Corolla with two yellow lines within throat anteriorly. Anther-sacs of both pairs of stamens uniform. Capsule globose to globose-ovoid, 3–7 mm. long. Seeds closely reticulate. 14. *Agalinis.*

Stem retrorse-hispid. Leaves lanceolate, usually auriculate-lobed at base. Pedicels less than 1 mm. long. Calyx-lobes ovate, longer than the tube. Corolla without yellow lines within throat anteriorly. Anther-sacs of pos-

terior pair of stamens shorter. Capsule broadly ovate, 10–13 mm. long. Seeds reticulate with raised ridges. 15. *Otophylla.*

Corolla purple-blue, salverform, the tube very narrow and densely pilose, the lobes widely spreading. Postero-lateral stamens becoming rudimentary, the antero-laterals with but one anther-sac. Stigmatic area over entire surface of style apex. Filaments and style less than one half length of corolla-tube. Capsule equaled by and enclosed within calyx-tube. 16. *Buchnera.*

CC. Posterior sepal shorter or wanting. Corolla decidedly two-lipped, the posterior lobes united and arched nearly to apex, the anterior lobes usually shorter; anterior or one antero-lateral lobes external in bud. Stigma short, capitate. VIII. Rhinantheae.

Posterior sepal shorter than others. Capsule turgid, septicidal, only tardily slightly loculicidal. Seeds linear, flat, 2 mm. long. 17. *Schwalbea.*

Posterior sepal wanting. Capsule flattened, loculicidal, splitting through septum.

Corolla with posterior lobes projecting, not hooded at apex, the anterior lobes very short, thickened, deep-green. Seeds many, reticulate. Bracts foliaceous, distally scarlet. 18. *Castilleja.*

Corolla with posterior lobes arched, hooded at apex, the anterior lobes membranous, flat, colored. Seeds few, not reticulate. Bracts not colored.

Corolla yellow or pink throughout, the anterior lip not raised into a palate. Seeds more than two. Sepals of each side united nearly or quite to apex. Leaves crenate-serrate to bipinnatifid-lobed.

Corolla 12 mm. long. Anthers lanose. Capsule circular, equally two-celled, splitting on both posterior and anterior sides. Seeds 5 mm. long, circular, flat, broadly winged. Sepals as long as the capsule, on each side united nearly to apex. Leaves crenate-serrate. Annual. 19. *Rhinanthus.*

Corolla 15–20 mm. long. Anthers glabrous. Capsule ensiform, un-

equally two-celled, splitting only on posterior side. Seeds 1 mm. long, oblong, cylindric, not winged. Sepals less than one half length of capsule, on each side united to apex. Leaves bipinnatifid-lobed. Perennials. 20. *Pedicularis.*

Corolla white, the anterior lip raised into a yellow densely pubescent palate. Seeds maturing two to a capsule. Sepals united at base only, the two postero-laterals longer. Leaves lanceolate, entire or setaceous-toothed near base. 21. *Melampyrum.*

1. VERBASCUM L., Sp. Pl. 177. 1753

Type species, *V. Thapsus* L. of Europe.

Leaves glabrous. Stem above and calyx with simple glandular hairs. Corolla yellow or white. Filaments all densely lanose with knobbed purple hairs. Pedicels 10–15 mm. long. Capsule subglobose, glandular-puberulent. Seeds .8–.9 mm. long, dark-gray. 1. *V. Blattaria.*

Leaves, stem and calyx more or less pubescent with stellately-branched non-glandular hairs. Corollas always yellow. Filaments: three posterior lanose, two anterior sparingly lanose to glabrous, with filiform yellow hairs. Pedicels less than 10 mm. long. Capsules ovoid or oblong, stellate-pubescent. Seeds .4–.7 mm. long, brownish-gray.

Leaves dark and becoming glabrate above, whitened beneath, sessile or the lower petiolate, not decurrent. Pedicels reaching 10 mm. long, clustered three to twelve in an axil. Sepals linear, 2–2.5 mm. long, much shorter than the mature capsule. Corolla 18 mm. wide. Capsule 4 mm. long. Seeds 6–7 mm. long. 2. *V. Lychnitis.*

Leaves dull- or yellowish-green and permanently pubescent above, scarcely paler beneath, sessile, more or less decurrent. Pedicels reaching 5 mm. long, one to five in an axil. Sepals ovate, 6–8 mm. long, slightly shorter than to equaling the mature capsule. Corolla 20–35 mm. wide. Capsule 6–8 mm. long. Seeds .4–.5 mm. long.

Stem-leaves broadly ovate, strongly crenate, dull-green, moderately pubescent. Pedicels reaching 5 mm. long, three to five to an axil. Inflorescence interrupted. Corolla 30–35 mm. wide. 3. *V. phlomoides.*

Stem-leaves lanceolate, finely crenate, yellowish-green, very densely pubescent. Inflorescence crowded. Pedicels very short to none, one to an axil. Corolla 20–22 mm. wide. 4. *V. Thapsus.*

1. VERBASCUM BLATTARIA L.

Flowering from mid-June to mid-August, fruiting from early July on.

Loam soil, cultivated fields, common throughout the area above the Fall-line, rarely recorded from the Coastal Plain. Naturalized from Eurasia.

2. VERBASCUM LYCHNITIS L.

Flowering from late June to August, fruiting from August on.

Loam soil, roadsides, local in the area above the Fall-line, especially near the cities. Naturalized from Eurasia.

3. VERBASCUM PHLOMOIDES L.

Collected in flower in July and August.

Probably sandy soil, cultivated fields; rare. Garden City, L. I.; Lindenwold, N. J. Adventitive from Eurasia.

4. VERBASCUM THAPSUS L.

Flowering from mid-July to late August, fruiting in August and September.

Mainly in loam soil, fields and roadsides; common throughout, mainly above the Fall-line. Naturalized from Eurasia.

2. PENSTEMON [Mitchell Schmidel, Icones Plantarum 2. 1762

Type species, *Chelone Penstemon* L., "Habitat in Virginia."

Corolla funnelform; throat tubular; lobes widely spreading; puberulent within. Leaves entire or the upper slightly serrulate, glabrous, under a lens evidently puncticulate. Seeds strongly ridge-angled. 1. *P. tubiflorus.*

Corolla with throat tubular near base, then abruptly inflated; pubescent within at base of anterior lobes. Leaves more or less denticulate, not evidently puncticulate under a lens. Seeds not strongly ridge-angled.

Corolla with throat inflated, its mouth open, not closed by the anterior lip. Sterile filament slightly to moderately densely bearded. Calyx-lobes ovate-lanceolate to lanceolate. Plants taller, glabrous to puberulent.

Corolla white, rather strongly inflated. Anther-sacs usually barbate. Stem glabrous or nearly so. 2. *P. Digitalis.*

Corolla light violet-purple, moderately inflated. Anther-sacs glabrous. Stem puberulent. 3. *P. Pentstemon.*

Corolla with throat scarcely inflated, its mouth closed by the anterior lip, which closes as a convex arc. Sterile filament very densely bearded. Calyx-lobes ovate. Plants lower, the stem pubescent or hirsute.

Corolla 15–20 mm. long, white with violet lines. Anther-sacs oval. Calyx-lobes obtuse to short-acuminate. Stem and leaves soft-canescent. Leaves lanceolate. 4. *P. pallidus.*

Corolla 23–28 mm. long, lavender-purple, unlined. Anther-sacs triangular-orbicular. Calyx-lobes acuminate to caudate. Stem and frequently midrib of leaves beneath more or less lanose-hirsute. Leaves lanceolate-attenuate. 5. *P. hirsutus.*

1. PENSTEMON TUBIFLORUS Nutt.

Flowering in June.

Fields, seen only from Spring Valley, Rockland Co., N. Y. Introduced from the southwestern Mississippi Valley.

2. PENSTEMON DIGITALIS Nutt.

Flowering from mid-June to early July, fruiting in late August and September.

Fields and meadows, frequent above Fall-line. Introduced from the southwestern Mississippi Valley.

3. PENSTEMON PENTSTEMON (L.) MacMillan.

Flowering in June and July.

Fields and meadows, seen only from Rockland Co., New York and Bergen and Gloucester counties, New Jersey. Introduced from the South Atlantic states.

4. PENSTEMON PALLIDUS Small, Fl. S. E. Un. St. 1060, 1337. 1903.

"Type, Bedford, N. Y., *Britton*, June, 1900, in Herb. N. Y. B. G." Type seen; also the plant re-collected and studied at the type-station.

Flowering from mid-May to late June.

Sandy or barren soil, occasional, mostly above the Fall-Line. Certainly introduced from the central Mississippi Valley.

5. PENSTEMON HIRSUTUS (L.) Willd.

Chelone hirsuta L., Sp. Pl. 611. 1753. "Habitat in Vir-

ginia." Based upon Clayton n. 39 in the Gronovian Herbarium. The Linnean characterization certainly denotes the plant here considered.

Penstemon hirsutus (L.) Willd., Sp. Pl. 3: 227. 1800.

Flowering from late May to early July, fruiting from July on.

Dry fields, usually sandy, in potassic soil, occasional or local through the area above the Fall-line. Ranges from southern Vermont and southern Ontario to upland Virginia, Kentucky and southern Michigan.*

3. CHELONE L., Sp. Pl. 611. 1753

Type species, *C. glabra* L.

1. CHELONE GLABRA L., Sp. Pl. 611. 1753. "Habitat in Virginia, Canada." Based upon a plant grown in the Clifford garden in Holland.

Chlonanthes tomentosa Raf., New Fl. Am. 2: 20. 1837. "In the mts. of Virginia." Leaves tomentose or pubescent beneath; a condition of more frequent occurrence southward, specimens noted from Monmouth, Burlington and Camden counties, New Jersey, and frequently through southeastern Pennsylvania. Here treated as a form, tomentosa (Raf.) Pennell, forma nova.

Flowering from early August to early October, fruiting from mid-September on.

Moist loam to sandy woodland, in potassic soil, frequent to common throughout above the Fall-line; frequent or occasional through the Coastal Plain, outside of the Pine Barrens. The leaves tend to be narrower in the Coastal Plain. Ranges from Newfoundland to Manitoba, northern Florida and Kansas.

4. SCROPHULARIA L., Sp. Pl. 619. 1753.

Type species, *S. nodosa* L., "Habitat in Europae succulentes."

Petioles stouter, evidently wing-margined. Leaves cuneate to truncate at base, coarsely serrate to dentate. Inflorescence narrowly elongate, 4–8 cm. wide, its branches rela-

* PAULOWNIA TOMENTOSA (Thunb.) Baill.

A tree with lavender flowers, is an occasional escape from cultivation to roadsides, railroad-banks and thickets. Adventive from eastern Asia.

tively stout. Calyx-lobes triangular-obtuse. Corolla 8–12 mm. long. Fertile filaments more evidently pulverulent. Sterile filament 1.8 mm. wide, yellow. Capsule pyramidal-acuminate, 5–10 mm. long. Seeds .8–1 mm. long, reticulate with transverse areas. Flowering in early summer. 1. *S. leporella.*

Petioles slender, scarcely margined. Leaves narrowed to cordate at base, more finely crenate-serrate. Inflorescence pyramidal, 5–18 cm. wide, its branches slender. Calyx-lobes more broadly rounded. Corolla 6–8 mm. long. Fertile filaments very finely pulverulent. Sterile filament 1 mm. wide, purple-brown. Capsule ovoid, acute, 4–7 mm. long. Seeds .5–.8 mm. long, plump, reticulate with more nearly hexagonal areas. Flowering in late summer. 2. *S. marilandica.*

SCROPHULARIA LEPORELLA Bickn. in Bull. Torr. Bot. Club 23: 317. 1896. "Common near New York City. . . . I have met with it within eight miles of the Connecticut line and in the Pocono region of eastern Pennsylvania." Specimen from Bronxville, Westchester Co., New York, collected by E. P. Bicknell June 15, 1895, seen in herbarium Columbia University at The New York Botanical Garden.

Only inconstantly to be distinguished from *S. occidentalis* (Rydb.) Bicknell of the Rocky Mountain and High Plains states by its leaves being less coarsely and more evenly serrate (in *occidentalis* frequently coarsely toothed at base), and the branches of the inflorescence being usually less stout and less densely glandular. Probably better considered as a geographic variety.

Flowering from mid-May to mid-July, fruiting from late June to late August.

Meadows and thickets, loam, in potassic soil, frequent throughout above the Fall-line; less frequent or occasional on Long Island, and in the Middle and Cape May district of New Jersey. Ranges from Quebec to Connecticut and Virginia, westward to North Dakota and Nebraska where it appears to pass into *S. occidentalis.*

2. SCROPHULARIA MARILANDICA L., Sp. Pl. 619. 1753. "Habitat in Virginia." Linné had no specimen in his herbarium in 1753, but his description is copied from Hortus Upsalensis 177. 1748. From the diagnosis there given, especially the mention of leaves cordate serrate, and of

petiole but very slightly decurrent, the plant of the Upsala Garden would appear to have been the species now considered.

Scrophularia lanceolata Pursh, Fl. Am. Sept. 2: 419. 1814. "In wet meadows and woods: Pennsylvania." Description apparently of this. The type of this should be verified, but the description of the petioles as not ciliate, and the lateness of the time of flowering would indicate that Pursh described as new the original *marilandica*.

Scrophularia nodosa marilandica (L.) A. Gray, Syn. Fl. N. Am. 2. 1: 258. 1878.

Scrophularia nodosa lanceolata (Pursh) M. E. Jones, Contrib. West. Bot. 12: 67. 1908.

Flowering from late July to late September, fruiting from early August into October.

Open woodland, loam, in potassic soil, frequent or northward rare through the area above the Fall-line; occasional in western Long Island, and near the Delaware River in the Middle District of New Jersey. Ranges from Massachusetts and southern Ontario to Georgia, Arkansas and Nebraska.

(To be continued.)

TUMION TAXIFOLIUM IN GEORGIA

By Roland M. Harper

The Florida "savin" or "stinking cedar," *Tumion taxifolium* (Arn.) Greene (*Torreya taxifolia* Arn.) an evergreen tree closely related to the yews, ever since its discovery by H. B. Croom near Aspalaga in western Middle Florida about 85 years ago, has been celebrated in botanical circles on account of its very restricted distribution and its belonging to a genus which was widespread in pre-historic times but is now practically confined to Florida, California, China and Japan.*

* Existing knowledge about this tree is pretty well summed up in the following works: Asa Gray, Am. Agriculturist 34: 266–267. 1875 (reprinted with some alterations in "Scientific Papers of Asa Gray," 1: 188–196. 1889); A. H. Curtiss, Tenth Census U. S. 9: 521. 1884; A. W. Chapman, Bot. Gaz. 10: 251–254. 1885; G. V. Nash, Bull. Torrey Club 23: 96. 1896; H. C. Cowles, Rep. 8th